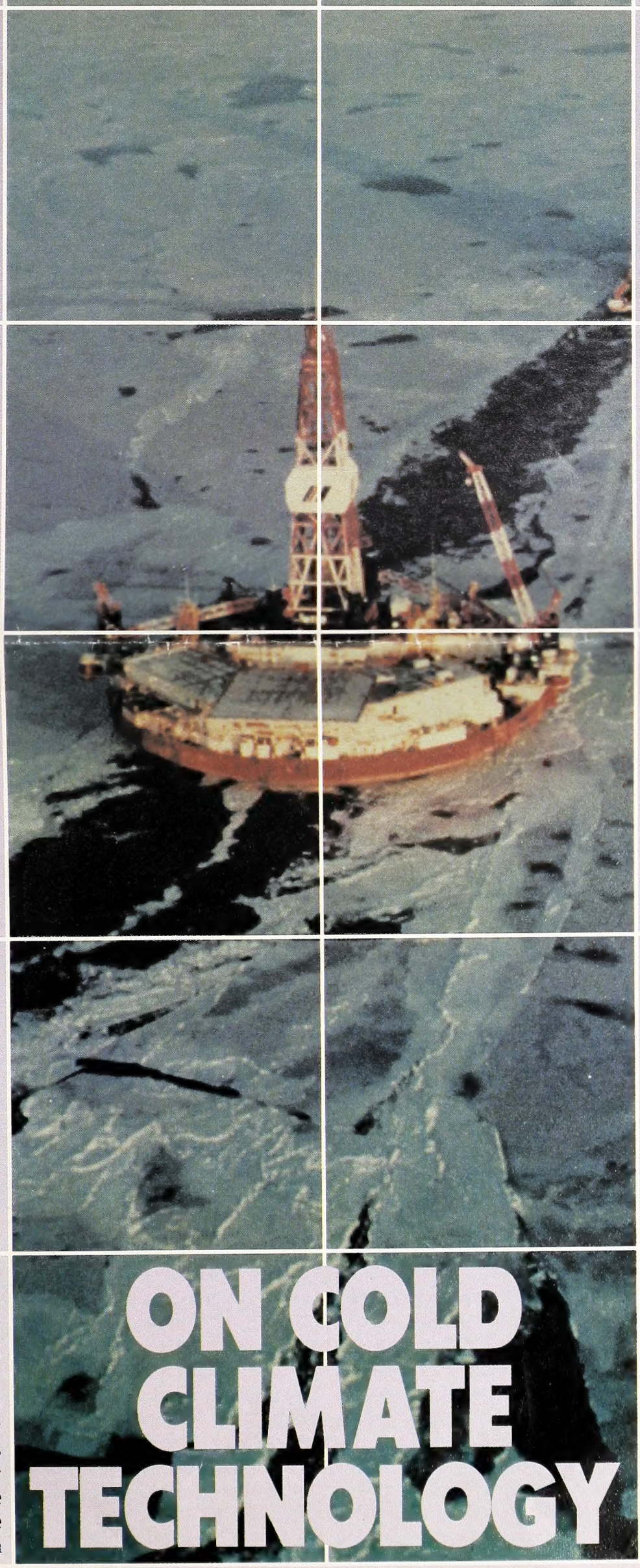
STORIES BY CONNIE BRYSON

FOCUS



ALBERTA COMPANIES ARE TURNING THEIR COLD CLIMATE EXPERTISE INTO COLD, HARD CASH

The 1988 Winter Olympics focussed the world's attention on Alberta's winter wonders. But for many Albertans, winter is more than snow-capped peaks and frozen lakes. To them, cold weather means business.

Alberta companies are major suppliers of products and services to cold regions, and are leaders in cold climate technologies. The expertise in the province cuts across a number of fields: engineering, logistics, oil and gas, communications, electronics and safety systems.

"There's real strength in Canada in cold regions work and the activity is centred in Alberta," says Don Hayley, vice-president, EBA Engineering Consultants Ltd. "The cutting edge engineering is done here. We have a technological lead."

The northern and offshore operations of oil and gas companies provided the initial stimulus for cold regions technology development in Alberta. Winter drilling, pipeline construction and operation, and offshore exploration required special products and services, and skilled employees. All were found in Alberta.

It's expected that much of the future growth of cold regions technology will also come from oil and gas exploration in frontier areas.

"There's tremendous potential for oil in the Beaufort Sea and for gas in the Mackenzie Delta," says Hayley. "The resources are there and we'll need them someday. We have to make sure we'll have the technology to exploit them safely."

The development of these technologies was one of the reasons Det norske Veritas (Canada) established its Centre for Cold Climate Technology in Calgary in 1981. DnV Canada is the Canadian company of Det norske Veritas, an international society which acts as a regulatory body in the classification, certification and quality assurance of ships and offshore exploration and production systems.

"DnV Canada is building its competence and providing the research capability to take advantage of Arctic development," says DnV senior research engineer Maher Nessim.

DnV Canada has been extensively involved in the development of ship and offshore technologies. The company classed Bow Drill 3, the first offshore drilling rig built in Canada, and has certified several drilling units on behalf of the Newfoundland government. Canada's POLAR 8, one of the world's largest icebreakers, will be built to DnV's ship classification rules.

While the oil and gas industry continues to demand cold weather technologies, there's also a growing market for these products and services in other sectors. For example, telecommunications, aviation and meteorology are all taking advantage of new "cold-proof" technology.

"In Canada, the push for development comes from the technological frontiers," says Larry Staples, vice-president, research, Centre for Frontier Engineering Research (C-FER).

"Applications for the new technologies are limited only by the imagination of small companies."

One such company is Edmonton's Datek Industries Ltd., which specializes in the control and measurement of oil and gas flows. Some of its products are designed to operate in temperatures as low as -65° C/-85° F.

"If you sell products in Alberta, you have to be cognizant of temperature extremes. At Datek, we learned how to do harsh environment engineering," says Datek's owner, Peter Van der Zee.

From its main business in control systems, Datek has branched out into the design and manufacture of a specialized remote unit for avalanche control which is now being used at Alberta's Lake Louise and Sunshine ski areas.

"Technologies developed at the extremes easily find their way into everyday use," continues C-FER's Staples. "I believe cold regions technologies will spin off in the same way as did technologies developed for the extremes of aerospace work. Many of

Continued on Focus 2

STRENGTH IN NUMBERS

Group helps companies sell unique expertise world-wide

With a solid reputation and market in Canada, Alberta companies are now looking at export opportunities for cold climate technologies.

"Our expertise in cold regions work may seem normal in Alberta, but elsewhere we are unique," says Mike Marks, a cold regions technology consultant with Alberta Economic Development and Trade.

"There are international opportunities in this area and our companies can compete effectively."

The drive to capture export markets was the impetus for the formation of the Cold Climate Technology Association of Canada (CCTAC). The association chairman is Jeff Pallister, vice-president of Calgary's Pallister Resource Management Ltd.

"Small companies can't afford to wait for opportunities at home," explains Pallister. "We're looking to the export market.

"That's where the growth is and we can't ignore it. But many companies don't have a great deal of export experience and find the market risky. The association is a way to increase the impact of marketing efforts and share costs and information."

Established just over a year ago, CCTAC undertook an assessment of the Antarctic market as its first project. The group's lobbying efforts resulted in Canada's membership in the Scientific Community for Antarctic Research (SCAR). Membership allows Canadian companies to supply goods and services to the Antarctic market, which Pallister estimates at close to $500 million.

"Countries that carry out research in the Antarctic are happy to see more suppliers," he says. "They need the very best equipment and were very receptive to what Canada has to offer."

CCTAC's second major project is a reconnaissance of market opportunities in Scandinavia. A membership drive is also underway.

CCTAC chairman Jeff Pallister visits the Australian Antarctic Division in Hobart, Tasmania.

"The Alberta government has been very helpful in developing the concept and spreading the word," Pallister says. "It's only recently that we began to think of cold climate technology as a separate industry."

The association acts as a clearing house for information, keeping members up to date on contracts and projects that are up for bid. Pallister also sees CCTAC as a launching pad for consortia and joint ventures.

"Many international projects require skills, products and services that are often beyond the capability of a single company," he says. "Working through the association, it will be easier to put consortia together and win international contracts."

Kulluk, a new-technology drilling unit operated in the Beaufort Sea by Gulf Canada Resources subsidiary, BeauDril Limited.

FOCUS ON COLD CLIMATE TECHNOLOGY

Continued from Focus 1

these quickly found applications in the aviation industry."

One example of a cold weather technology with wide application is the Synthetic Aperture Radar (SAR) developed by Calgary's Intera Technologies Ltd. The radar is as good at ice monitoring in the Arctic as it is at mapping in the tropics. It is particularly valuable because it can "see" through clouds.

Intera recently won a $58-million contract to provide a comprehensive all-weather ice reconnaissance service to the Canadian government. A Challenger jet has been outfitted with two SAR units.

The new SAR-equipped aircraft will provide more detailed ice information in a faster response time than was previously available. The improved service will be available to the Canadian Coast Guard and to merchant shipping and fishing vessels.

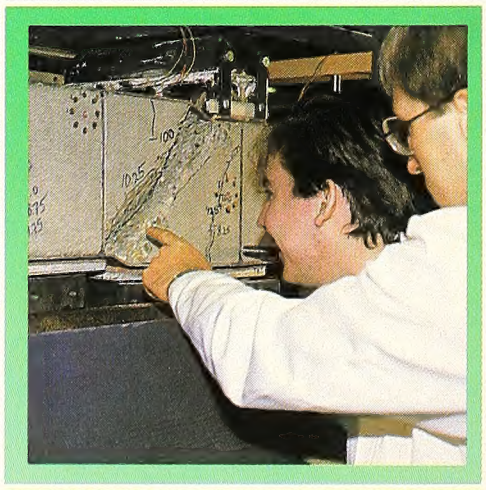
The SAR system was used recently to map land newly acquired by a Colombian forest company. Constant cloud cover over the tropical forest made air photography impossible and rendered satellite data useless. By using its SAR system, Intera provided the client with maps of the land and a detailed report on the forest resources.

Another remote sensing company, Calgary's ITRES Research Ltd., is in the final stages of developing a commercial prototype for its compact airborne spectrographic imager (CASI). Instead of relying on satellite data, CASI will allow companies to do their own remote sensing work from a small plane at low cost. Cold regions applications include monitoring pollution in open water and ice reconnaissance.

"ITRES is after a specialized international market and we've found that Alberta is a fine location for our company," says ITRES president Dr. Cliff Anger. "There's a favorable government environment and a pool of skilled manpower. The University of Calgary is close by and we're planning even greater interaction in the future."

Alberta universities carry out a wide range of cold regions research, and faculty members work with a number of Alberta companies. Engineering specialties include cold climate environmental and structural engineering, permafrost engineering and transportation engineering.

C-FER vice-president Larry Staples sums up the Alberta advantage: "With its mix of research capability and engineering know-how, the cold weather engineering community in Alberta is one of the most advanced in the world."



C-FER researchers: in Canada the push for development comes from the technological frontiers.

THE BIG CHILLER

High-tech cold room

When the Energy Resources Conservation Board's Service Rig Inspection Committee wanted to know at what temperature blow-out preventers can be operated safely, it turned to the Electronics Test Centre.

"Blow-out preventers are the main source of well control," explains Trevor Wignall, a rig committee member and completions operations manager for Esso Resources Canada Ltd. "It was critical that we find out the operating limits of the preventers. There was little technical data on this."

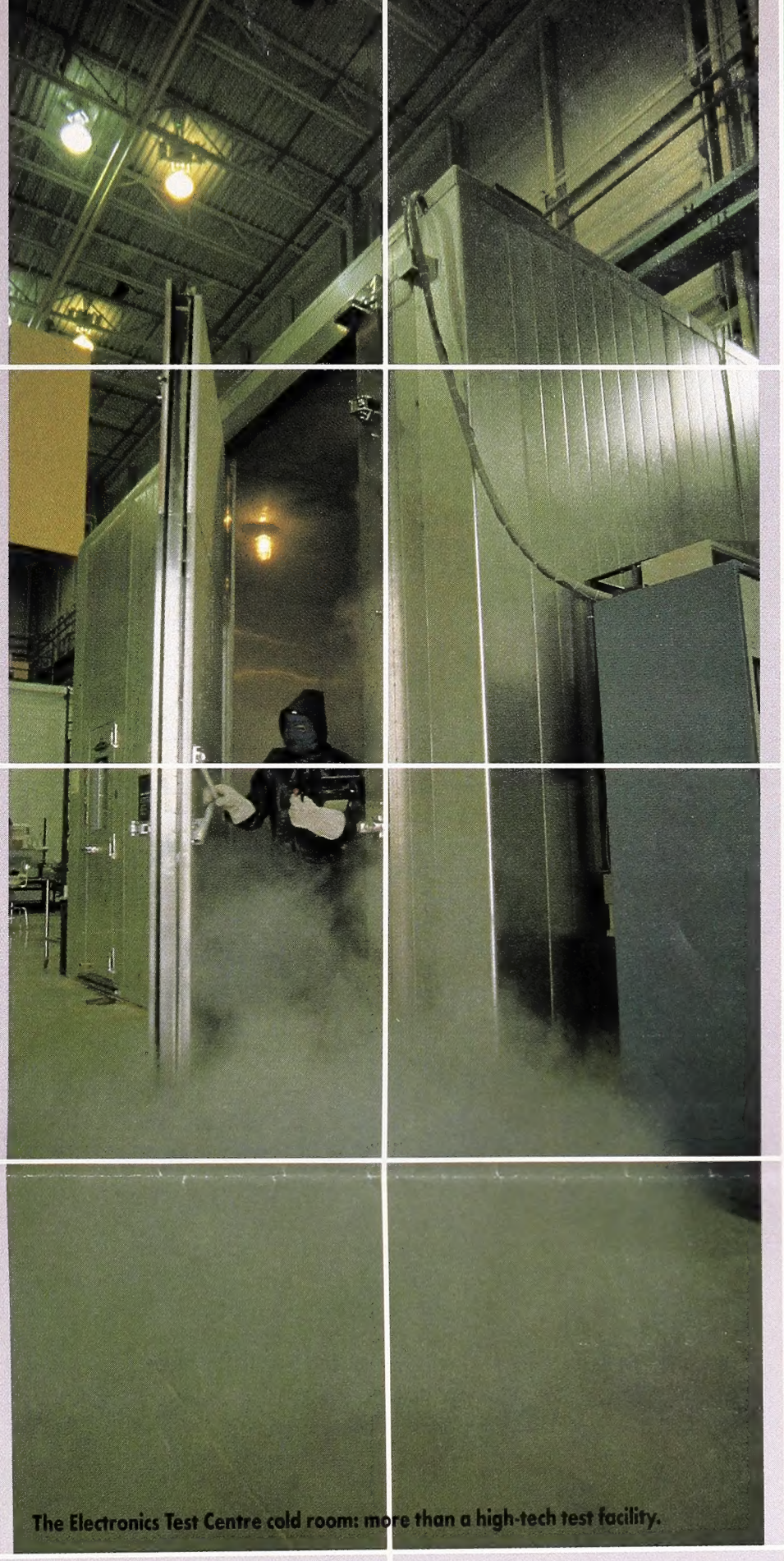
Testing was done in the large cold room at the Electronics Test Centre. The results formed the basis of the recommendations published in the new rig inspection manual.

"I was amazed by the capability at the centre," says Wignall. "They have a superb facility, they were extremely cooperative, and the price was right."

Cold weather environmental testing is just one of the services available at the Electronics Test Centre. Sponsored by the Alberta Research Council, the centre is the only facility in Western Canada offering a wide variety of electronics engineering and test services to designers, manufacturers, purchasers and government agencies.

But it is the skilled professionals who operate the centre that make it more than a high-tech test facility, says John Beddoes, the centre's director of business development.

"We believe that tests aren't very meaningful if all we tell a client is that the product failed. We go a couple steps further and report when it failed and why it failed. We also make recommendations for suggested fixes. It's a complete service."



The Electronics Test Centre cold room: more than a high-tech test facility.

DESIGNING FOR ICE

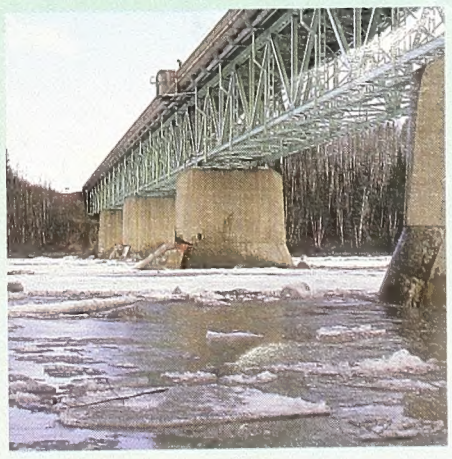
Ice — it's what makes building a bridge in Alberta different from building one in Africa. The simple fact that water freezes creates a whole set of water resource engineering problems not only for designing bridges, but for designing municipal water intakes, operating hydro power dams, and protecting the assimilation capacity of rivers.

The Alberta Research Council, in conjunction with Alberta Environment and Alberta Transportation and Utilities, has undertaken a number of projects related to water resources technology in cold regions. These include the development of models to forecast the time of spring break-up on Alberta rivers, research on improving the design criteria for the efficient dispersion of pulp mill effluent into ice-covered rivers, studies of ice loads on bridges, and the development of improved guidelines for flood delineation.

"Our research is aimed at improving the management of our water resources in cold regions," says David Andres, manager of surface water engineering research at the Research Council.

"The major benefits of our work are the understanding of specific cold region processes and the improvement of design guidelines to account for these processes. If we don't know what we're dealing with, it is difficult to define the design conditions. And when we aren't sure of what systems have to withstand or how they behave, our designs tend to be somewhat subjective.

"As a result, designers tend to be conservative and structures often may be more expensive than is necessary. On the other hand, failures can result because the existing design methodology does not include cold climate processes."



Ice makes building a bridge in Alberta different from building one in Africa.

SENSORS FOR SAFETY

Systems help pilots detect changes in weather and runway conditions

An innovative approach to high-tech electronic navigation and meteorological systems won Calgary-based Pelorus Navigation Systems Inc. a 1988 Canada Award for Business Excellence.

One of the company's newest products is a cold weather technology — an Automated Weather Observation System (AWOS). At unmanned airports, pilots wishing to land tune their radios to the system's frequency and receive a voice-synthesized weather report.

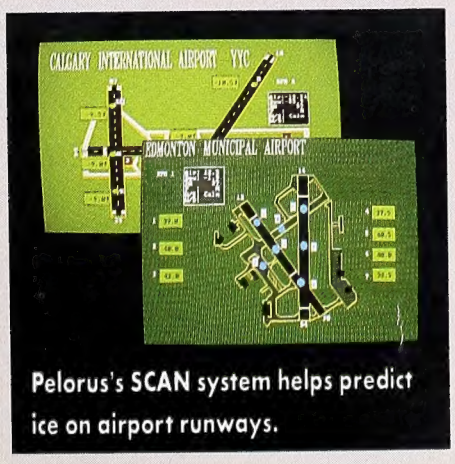
Whereas manned weather observations are taken once an hour, sensors in the Pelorus system send information to a computer every second. The data is then analyzed and the computer provides minute-by-minute weather reports. Pelorus president Ed Fitzhenry predicts that this technology will replace manned weather observation stations throughout the world. Pelorus is the only manufacturer of AWOS in Canada.

Another cold weather technology marketed by Pelorus is a pavement surface condition analysis (SCAN) system. Sensors in airport runway pavement monitor pavement temperature, chemical concentration, whether the runway is wet or dry, and whether snow or ice is present.

With SCAN, operators can predict and detect the formation of ice on runways. The result is improved runway safety and reduced maintenance costs.

"The trick to having components that work in the cold is the electronics," says Fitzhenry. "You must select components and parts carefully.

"For cold weather technology information and expertise, there's no better place than Alberta. The provincial government had a very clear vision when it established marvelous institutions like the Alberta Microelectronic Centre, the Electronics Test Centre, and the Alberta Research Council. And with our great universities and technical schools, companies like Pelorus have access to a strong pool of talent."



Pelorus's SCAN system helps predict ice on airport runways.

C-FER LEADS THE WAY

Centre is a model of Canadian research management

Key to maintaining Alberta's lead in cold regions engineering is the Centre for Frontier Engineering Research (C-FER).

The Centre was established in 1983 with a mandate to address problems related to the safe and economical development of Canada's petroleum resources.

Successful collaboration among industry, governments and universities has made C-FER a model of Canadian research management. Its research programs are focussed on two major areas: offshore and marine technology and downhole technology.

The offshore structures program deals with the design and behavior of structural components used in low-temperature environments.

C-FER also runs a networking program designed to facilitate the movement of current technical information. As one networking project, C-FER and DIPOL — a French consortium of industrial and government-related organizations with Arctic interests — recently coordinated a collaborative workshop on cold regions technologies. Held in France in late March, the workshop was a component of the Canada/France Science and Technology Cooperation Program.

C-FER is currently located on the University of Alberta campus. In 1987, an argeement signed by C-FER and the federal and provincial governments committed funds for an $18-million test facility. It will be located in the Edmonton Research Park. Construction began in May.

Two features of the new facility are geared to cold regions engineering work: the strong floor — a flexible test bed for large assemblies — and the cold chamber, which will accommodate large assemblies and will have a temperature range of 20° C to -60° C/ 68° F to -76° F.

"The new lab will be one of the best in the world for the investigation of cold climate problems," says Larry Staples, C-FER's vice-president, research. "But top-notch facilities don't mean anything if you don't have top-notch researchers. C-FER's real strength is its research team. Now we'll be able to leverage that intellectual strength with our new lab."

The new facility will allow for large-scale testing, a distinct advantage over lab-scale tests which don't accurately reflect what happens in the real world.

"In northern Canada and offshore Newfoundland the ice loads are so high they're at the fringes of civil engineering technology," Staples explains. "As a result, there's a lot of conservatism in design. Engineers must add in many safety factors because of uncertainty.

"As we push ahead and conduct large-scale tests, which translate directly into design criteria, we can get rid of the layers of safety due to uncertainty. This means more efficient design, construction and operation. The structures themselves will become much less expensive to build."

One of C-FER's cold regions projects is the development of a new type of ice-resisting wall. Ice forces on offshore structures supporting drilling units are tremendous. Traditionally, there were only two options for wall materials — reinforced concrete or structural steel.

Architect's rendering of C-FER's new test facility.

Recent developments in composite walls, which make use of both concrete and steel, show great promise for use on Beaufort Sea petroleum production structures. A C-FER research team headed by senior research engineer Tom Zimmerman has developed an innovative composite wall design with key features of simplicity and ease of fabrication.

C-FER's expertise in wall design has led to a contract with Gulf Canada. C-FER researchers are studying three wall types — steel, concrete and composite — and will advise Gulf on the relative merits and demerits of each. The work is done in conjunction with a U.S. engineering company, Ben C. Gerwick Inc.

Another cold regions project, undertaken for the Canadian Coast Guard, is the first study of Canadian steels in Arctic marine service. The aim of the project is to understand weldline corrosion on the hull of the MV Arctic, a Class IV ice-rated cargo ship and research vessel. Corrosion is always a problem at sea, but travelling through ice is particularly hard on a ship's hull.

Headed by project officer Bernie Luft, a C-FER research team travels to the ship in its various ports of call. They observe and monitor corrosion as it occurs under actual service conditions. Correlating these field observations with laboratory work will help establish accurate lab tests which should lessen the need for extensive, time-consuming field trials.

Research capability on the order of C-FER's is expensive to maintain and beyond the finances of all but the very largest companies. As a result, C-FER has evolved into a forum for industrial interaction.

"Input from industry keeps our work oriented to projects that will have engineering results," says Staples. "We've also been able to reach into the university system, tap into the highest available technology, and pull it out in a way that's convenient to faculty members.

"Consequently we have the expertise and can turn out research projects in a time frame required by industry. We've got the best of both worlds."

At the May groundbreaking for C-FER's new facility (L ro R) Don Mazankowski, deputy prime minister of Canada; Fred Stewart, Alberta's minister of technology, research and telecommunications; and Ernie Pallister, chairman of C-FER's board of directors.

LIFE-SAVING SNACKS

Like cars on frigid mornings, people also slow down in the cold. An extra layer of clothing and vigorous exercise usually help, but if the body continues to lose heat there can be serious trouble.

Dr. Larry Wang, a University of Alberta zoology professor, has developed an energy-boosting snack which delays the onset of hypothermia, a condition in which the body loses heat faster than it can replace it. At body temperatures below 28° to 29° C/82.4° to 84.2° F, hypothermia can kill.

For those in danger of hypothermia, eating one of Dr. Wang's snacks cuts that body temperature drop in half. Tests show the effect lasts for about three hours.

Patent and technology transfer arrangements are under negotiation. The snack could be on the market by next winter.